

# **National Association of Broadcasters • 2 GHz Usage Survey**

## **Statement of William F. Hammett, Consulting Engineer**

The firm of Hammett & Edison, Inc., has been retained by the National Association of Broadcasters (NAB) to conduct a survey of frequency coordinators in the largest television markets to determine the scope of Electronic News Gathering (ENG) activity in the 2 GHz Television Broadcast Auxiliary band and the users' perspective on the potential for future usage.

### **About the Survey**

The survey questions, attached as Figure 1, were compiled in consultation with the NAB Office of Science and Technology. The survey was broadly divided into five sections:

- Respondent Information
- Usage Patterns
- Coordination Patterns
- ATV Perspective
- Nonbroadcast Usage.

All interviews were conducted by Daniel Mansergh, an employee of Hammett & Edison, by telephone between April 27 and May 2, 1995.

### **About the Respondents**

The 2 GHz frequency coordinators in the 25 largest television markets, determined by 1993-1994 Arbitron ranking, were contacted to be a part of the survey. Of these, 23 responded; a summary list of the markets represented is attached as Figure 2. In addition, to complement the perspectives of the local coordinators with an outside viewpoint, an interview was conducted with the coordinator of remote camera operations for a major broadcast network.

### **Usage Patterns**

As expected, all of the respondents indicated that the 2 GHz band is used for ENG in their area (some said "exclusively") and fully 100% characterized the 2 GHz band as congested. One coordinator felt that "'congested' is a mild word," since "the 2 gig band is so over-used, fisticuffs almost break out" between the users. 87% noted changes in demand during the day, identifying 'news time' as the primary variable; the most common hours specified for the highest activity were 6:30 to 9:00 AM, 11:00 AM to 1:00 PM, 3:30 to 7:00 PM, and 9:30 to 11:30 PM.

83% of the respondents saw a change in demand by day of the week, with most activity on the weekdays. Several users commented that the extent of the demand did not vary much, but that the



## National Association of Broadcasters • 2 GHz Usage Survey

changes were more marked in *type* of usage; weekday demand came primarily from news providers, while weekend use was typically related to sporting events. Fewer coordinators observed changes from season to season; 61% saw no change in demand, while most of those who did could detect no discernible pattern. The remainder attributed seasonal differences to causes ranging from sports seasons to the winter influx of vacationers in Arizona and Florida.

### Coordination Patterns

As illustrated in Figure 3, about half of the respondents found frequency coordination of the 2 GHz band in their market to be VERY DIFFICULT or SOMEWHAT DIFFICULT, citing the overall congestion of the band as the primary reason for the task's complexity. 44% thought coordination was either NOT VERY DIFFICULT or NOT DIFFICULT, attributing this ease to good working relationships between the 2 GHz users, complemented by effective management strategies such as "home channel" plans and "gentlemen's agreements." The remaining 9% said coordination difficulty "depends on events," noting that day-to-day usage tends to run smoothly but that coordinating with out-of-town users often "becomes a headache."

In identifying the historical trends of coordination difficulty within their markets, 48% of the respondents found coordination to be about as difficult as it was one year ago, while 43% thought it was more difficult today because of recent increases in demand for 2 GHz frequencies. 74% said coordination is more difficult now than it was five years ago, also attributing it to the increased usage.

Impressions of the relative difficulty of coordination between the various users were decidedly split. Roughly half of the respondents found coordination more difficult with the broadcast networks, citing a lack of regard for local coordination authority and the continued use of fixed frequency (*i.e.*, non-frequency agile) equipment as prime challenges. The remaining half thought it was equally difficult among local and network entities.

Frequency coordinators and 2 GHz users are increasingly using creative work-arounds to fit more users into the existing frequencies. 70% have tried to transmit more than one feed on a single channel using reduced deviation FM video, off-center frequency offsets, and cross polarization, reporting varying degrees of success. In many of the largest markets, these methods have become part of the "standard operating procedure." For special events, when ENG needs are highest, 39% of the respondents have tried "band borrowing" from other 2 GHz services pursuant to event-specific FCC Special Temporary Authority.



## National Association of Broadcasters • 2 GHz Usage Survey

### ATV Perspective

Although most of the respondents expressed uncertainty about trying to predict the future ENG needs of a fully-deployed ATV system in their market, 78% felt there will *not* be enough spectrum in the 2 GHz band to support such new, high-bandwidth services. One coordinator went so far as to characterize NTSC and ATV ENG operations as “mutually exclusive,” warning that “unless a lot of changes occur, you can’t come in tomorrow and turn it [ATV] on.” Another 13% thought that there might be enough spectrum, given appropriate technological innovations in digital ENG and compression techniques, while the remaining 9% felt that too much was still unknown to even hazard a guess. These results are illustrated in the attached Figure 4.

### Nonbroadcast Usage

Of the respondents, 61% were aware of nonbroadcast users of the 2 or 2.5 GHz frequencies in their markets, listing examples ranging from law enforcement agencies and schools to a plastic welding machine and cash register LAN at a sports arena. 57% saw coordination with those users as part of their responsibility, although the users did not always cooperate. Of those who were aware of nonbroadcast users, 64% felt that this use of 2 GHz spectrum did not add much to the overall congestion, although other coordinators said such uses added as much as 30% additional congestion. Many coordinators expressed frustration with nonbroadcast users, bemoaning their tendency to think that “they don’t have to coordinate.”

### Outside Perspective

In addition to the survey of local frequency coordinators, a brief interview with a major broadcast network’s remote camera coordinator was conducted to add the insights of a constant user of 2 GHz frequencies in various markets around the country. “Year-in, year-out, our biggest demand is for Indy car races,” he notes, explaining that, for a big race, he uses all seven 2 GHz channels on a coordinated timeshare basis, plus any other frequencies he can obtain authorization to use. He regularly requests STAs for 2,310–2,390 and 2,390–2,450 MHz, which are generally granted “once the hurdles are cleared initially with the local users.” ATV, in his opinion, “would definitely add complexity” to the task of gaining usage of 2 GHz frequencies for his events. “We need more frequencies,” he adds, “Any loss of 2 gig channels would be detrimental.”



## National Association of Broadcasters • 2 GHz Usage Survey

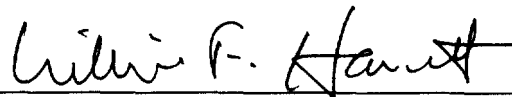
### Range of Opinion

Although the frequency coordinators in the major markets face unique challenges and have varied perspectives on the use of 2 GHz frequencies for ENG, they are remarkably consistent in their desire for more spectrum. "I can't see how too much more will be able to fit into the existing spectrum," commented one coordinator. Another warned, "If the Commission is considering giving these frequencies away, it will cause such chaos that the broadcast industry may not recover." A final respondent summed up his frustrations with, "I wish there was more spectrum available. Most users understand the limitations and use low power, but there's just not enough room."

### List of Figures

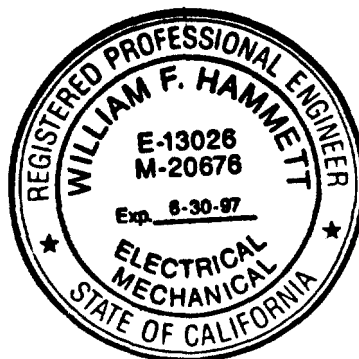
In carrying out these engineering studies, the following attached figures were prepared under my direct supervision:

1. Survey questionnaire
2. List of surveyed markets
3. Results: coordination difficulty
4. Results: ATV needs.



William F. Hammett, P.E.

May 4, 1995



HAMMETT & EDISON, INC.  
CONSULTING ENGINEERS  
SAN FRANCISCO

## Affidavit

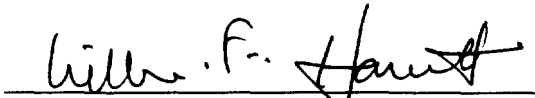
State of California

ss:

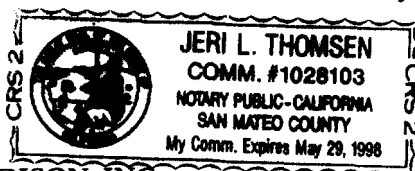
County of Sonoma

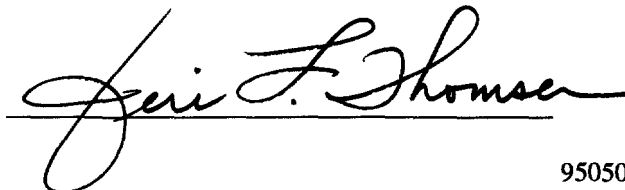
William F. Hammett, being first duly sworn upon oath, deposes and says:

1. That he is a qualified Registered Professional Engineer, holds California Registrations Nos. E-013026 and M-020676, which expire on June 30, 1997, and is a principal in the firm of Hammett & Edison, Inc., Consulting Engineers, with offices located near the city of San Francisco, California,
2. That he graduated from Dartmouth College with a degree in Engineering Sciences in 1977 and from the University of Illinois with a degree of Master of Science in 1978, has completed two years of employment by the Standard Oil Company and five years by Dean Witter Reynolds in various engineering, computer, and management capacities, and has been associated with the firm of Hammett & Edison, Inc., since 1985,
3. That the firm of Hammett & Edison, Inc., Consulting Engineers, has been retained by the National Association of Broadcasters (NAB) to conduct a survey of frequency coordinators in the largest television markets to determine the scope of Electronic News Gathering (ENG) activity in the 2 GHz Television Broadcast Auxiliary band and the users' perspective on the potential for future usage,
4. That such engineering work has been carried out by him or under his direction and that the results thereof are attached hereto and form a part of this affidavit, and
5. That the foregoing statement and the report regarding the aforementioned engineering work are true and correct of his own knowledge except such statements made therein on information and belief and, as to such statements, he believes them to be true.

  
William F. Hammett, P.E.

Subscribed and sworn to before me this 4th day of May, 1995







**HAMMETT & EDISON, INC.**  
CONSULTING ENGINEERS  
SAN FRANCISCO

950505  
Affidavit

# National Association of Broadcasters • 2 GHz Usage Survey

## Survey Questionnaire

Coordinator: \_\_\_\_\_ Market: \_\_\_\_\_

1 Are you the coordinator for the 2 GHz band in your area? (Y/N) \_\_\_\_\_

If not, who is? \_\_\_\_\_ Phone: \_\_\_\_\_

2A Is the 2 GHz band used for Electronic News Gathering in your area? (Y/N) \_\_\_\_\_

2B Would you say that the 2 GHz band is congested? (Y/N) \_\_\_\_\_

2C Does demand for 2 GHz spectrum vary by time of day? (Y/N) \_\_\_\_\_

2D What time of day has the heaviest demand? \_\_\_\_\_

2E Does demand vary by day of the week (weekends) or on holidays? (Y/N) \_\_\_\_\_

2F What days or holidays have the highest demand? \_\_\_\_\_

2G Does demand vary by season? (Y/N) \_\_\_\_\_

2H What season has the heaviest demand? \_\_\_\_\_

3A In characterizing 2 GHz frequency congestion in your area, is frequency coordination:

Very difficult \_\_\_\_\_ Somewhat difficult \_\_\_\_\_ Not very difficult \_\_\_\_\_ Not difficult \_\_\_\_\_

Why? \_\_\_\_\_

3B Is frequency coordination more or less difficult than it was 1 year ago?

More \_\_\_\_\_ Less \_\_\_\_\_ Same \_\_\_\_\_ Don't Know \_\_\_\_\_ Why? \_\_\_\_\_

3C Is frequency coordination more or less difficult than it was 5 years ago?

More \_\_\_\_\_ Less \_\_\_\_\_ Same \_\_\_\_\_ Don't Know \_\_\_\_\_ Why? \_\_\_\_\_

3D Have you found coordination more difficult with: Local TV stations \_\_\_\_\_

Broadcast Networks (ABC, NBC, CBS, FOX, PBS, UPN, WB) \_\_\_\_\_

Cable Networks (CNN, ESPN, SportsChannel) \_\_\_\_\_

No difference in difficulty \_\_\_\_\_

3E Do you use reduced deviation FM video, off-center frequency offsets and cross polarization to allow two simultaneous ENG feeds in one channel? (Y/N) \_\_\_\_\_

3F Have you ever attempted "band borrowing" with an FCC STA, using other frequencies (such as 2310-2450), for special event ENG overflow? (Y/N) \_\_\_\_\_

4 Given your understanding of ATV, do you think there is sufficient spectrum in the 2 GHz band to support existing NTSC and future ATV ENG needs? (Y/N) \_\_\_\_\_

Why? \_\_\_\_\_

5A Are you aware of nonbroadcast users of the 2.5 GHz band in your area? (Y/N) \_\_\_\_\_

5B Is coordination with nonbroadcast users part of your responsibility? (Y/N) \_\_\_\_\_

5C How much do these operations add to congestion? \_\_\_\_\_



## National Association of Broadcasters • 2 GHz Usage Survey

### List of Surveyed Markets

<u>Rank*</u>	<u>Market</u>	<u>TV Households*</u>
1†	New York, NY	6,723,700
2	Los Angeles, CA	4,978,800
3	Chicago, IL	3,076,500
4	Philadelphia, PA	2,661,800
5	San Francisco, CA	2,225,500
6	Boston, MA	2,116,200
7	Washington, DC	1,822,400
8	Dallas/Ft. Worth, TX	1,788,000
9	Detroit, MI	1,739,100
10	Houston, TX	1,520,900
11	Atlanta, GA	1,516,300
12	Cleveland, OH	1,449,700
13	Seattle/Tacoma, WA	1,438,600
14	Minneapolis/St. Paul, MN	1,418,100
15	Miami, FL	1,308,200
16†	Tampa, FL	1,266,600
17	Pittsburgh, PA	1,152,500
18	St. Louis, MO	1,114,200
19	Sacramento/Stockton, CA	1,093,000
20	Denver, CO	1,090,100
21	Phoenix, AZ	1,061,300
22	Baltimore, MD	977,100
23	Orlando/Daytona Beach, FL	972,100
24	San Diego, CA	919,900
25	Hartford/New Haven, CT	912,400

\* Based on 1993–1994 Arbitron Television Markets and Rankings Guide

† Coordinator not available at time of survey.



**HAMMETT & EDISON, INC.**  
CONSULTING ENGINEERS  
SAN FRANCISCO

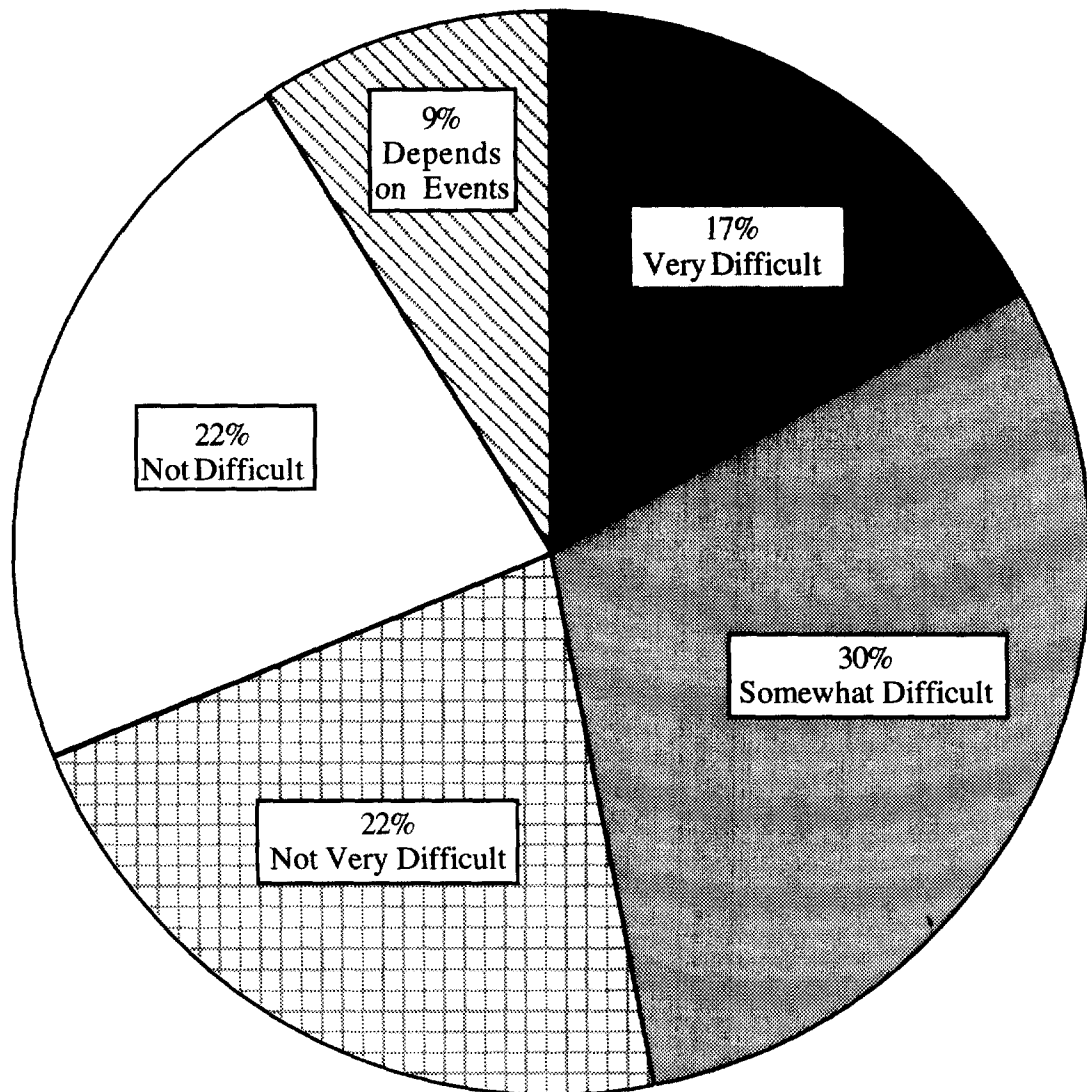
950505  
Figure 2

# National Association of Broadcasters • 2 GHz Usage Survey

## Results: Coordination Difficulty

Question 3A:

In characterizing 2 GHz frequency congestion in your area, how difficult is frequency coordination?

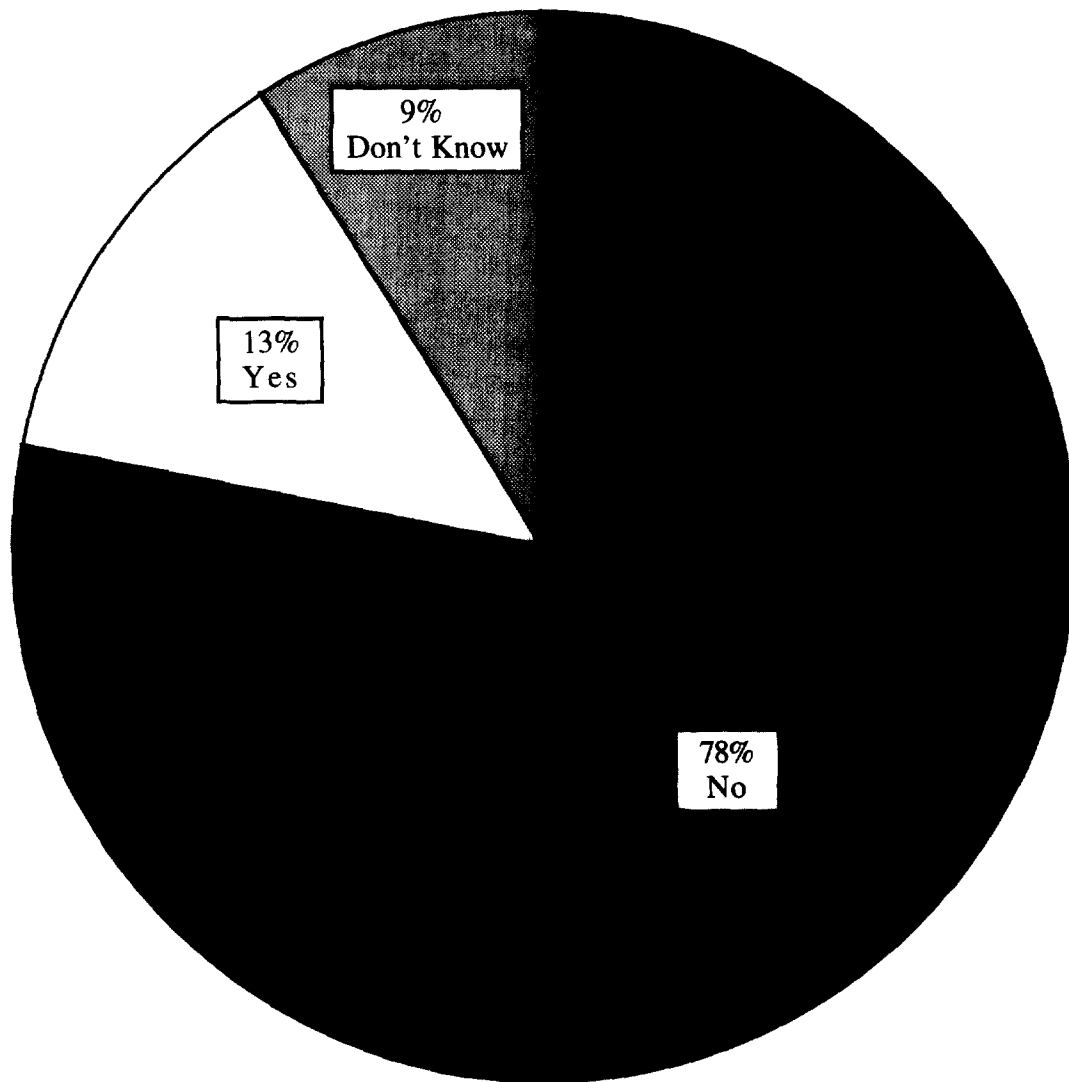


**National Association of Broadcasters • 2 GHz Usage Survey**

**Results: ATV Needs**

Question 4:

Given your understanding of ATV, do you think there is sufficient spectrum in the 2 GHz band to support existing NTSC and future ATV ENG needs?





**1995 NAB 2 GHz TV  
Auxiliary Facilities Survey**

**Mark R. Fratrik, Ph.D.  
Vice President/Economist  
NAB Research and Planning Department**

**Kelly T. Williams  
Director of Engineering  
NAB Science and Technology**

**May 5, 1995**

---

## **Executive Summary**

In April 1995, NAB conducted a survey of commercial and non-commercial television stations asking about their investment in 2 GHz microwave equipment. Data were collected using a fax survey sent to 1,060 television stations with a known fax number. Usable responses were received from 715 stations, representing a response rate of 67.5%. The data were analyzed with respect to the stations' market sizes and also compared with results from an identical survey conducted in 1991.

Some of the more notable results include:

- Over three-quarters (77.5%) of responding stations indicated that they own 2 GHz microwave equipment.
- The percentage of stations owning 2 GHz equipment is slightly higher in the mid-sized and smallest markets, but nearly three quarter (74.1%) of stations in the largest markets (market sizes 1-50) own such equipment.
- The average number of 2 GHz transmitters owned or operated by these stations is 5.1, slightly higher than the average from the earlier survey (4.5). Stations in the largest markets reported owning the most transmitters (7.2).
- The average number of 2 GHz receivers owned or operated by these stations is 3.9, also slightly higher than the average from the earlier survey (3.6). Once again, stations in the largest markets reported owning the most receivers (4.9).

What can be clearly seen from this survey, as well as from the earlier survey, is that television stations have made serious commitments to investing in 2 GHz equipment, and that commitment has grown in just the past few years.

---

# **1995 NAB 2 GHz TV Auxiliary Facilities Survey**

## **I. Introduction**

With the increased demands on usage of the spectrum, some have suggested reallocating several existing users of the spectrum to other areas. Specifically, potential MSS providers would like to use a portion of the 2 GHz spectrum now being used by broadcasters for auxiliary, primarily local news gathering, purposes.

In order to determine the "costs" of this suggested reallocation, we surveyed broadcasters in April-May 1995 on the extent of their investment in 2 GHz transmitting and receiving equipment. The survey instrument was faxed to all commercial and non-commercial television stations (1060 television stations) with known fax numbers during April 1995. We received 716 completed and usable questionnaires, for a response rate of 67.5%. The survey instrument is identical to a survey of broadcasters conducted in June 1991, and is included as Appendix A.

Both survey questionnaires asked for information on the number of 2 GHz transmitters and receivers owned or operated and whether those transmitters are permanently installed in ENG vehicles, configured as portable units, or installed at fixed locations. In addition to comparing the 1995 results with those of the earlier survey, we will also examine the results from stations across different sized markets.

## **II. Owning 2 GHz Equipment**

A general question on whether the station owned any 2 GHz equipment was asked of respondents. Over three-quarters (77.5%) of responding stations indicated that they do own such equipment. This percentage is slightly lower (1.6%) than the results obtained in the earlier

## 1995 NAB 2 GHz TV Auxiliary Facilities Survey

---

survey. Given the higher response rate of this survey (67.5% vs. 53.8%), it is not surprising to see slight differences.

There are some small differences in the ownership of 2 GHz equipment across the various market size groupings<sup>1</sup>. Table 1 shows the percentage of stations owning 2 GHz microwave equipment across different market sizes.

**Table 1**  
**Ownership of 2 GHz Microwave Equipment**  
**by Market Size**

	1-50	51-100	101+	Non-DMA <sup>2</sup>
Percentage of Stations Owning 2 GHz Microwave Equipment	74.1%	81.6%	78.1%	75.0%

It might seem counter-intuitive that stations in midsized and smallest (DMAs 51-100 and 101+, respectively) markets have a higher percentage of ownership of this type of equipment. Remember, however, that the largest markets have many television stations which operate on a very small scale.

### III. Amount of Equipment Owned

Stations that reported owning 2 GHz microwave equipment have a noticeable investment in that equipment, and that amount seems to be growing moderately.<sup>3</sup> Figure 1 shows the average number of 2 GHz transmitters owned or operated by those stations which reported owning such equipment. Also included in the figure is a comparison to the results to the earlier survey.

---

<sup>1</sup> For purposes of defining relevant geographic markets and their sizes, we will use the widely accepted A.C. Nielsen Co., DMAs (Designated Market Areas)

<sup>2</sup> These include responding stations in Puerto Rico, Virgin Island, and parts of Alaska which are located in areas not surveyed by A.C. Nielsen Co.

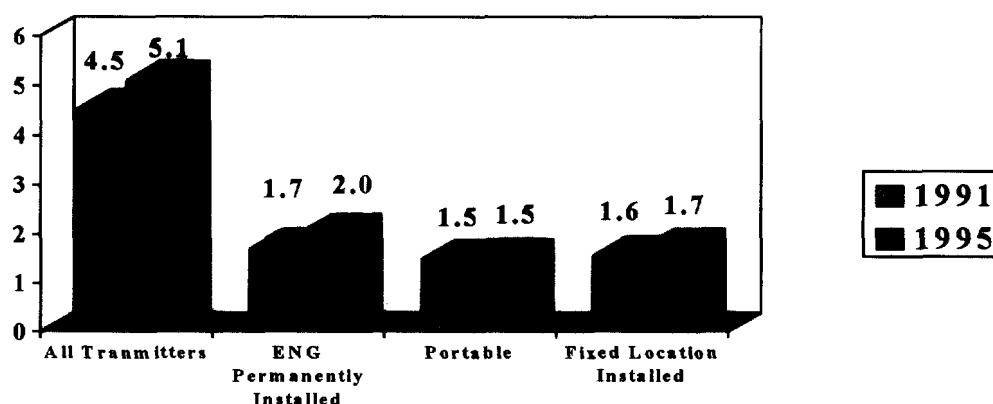
<sup>3</sup> We also obtained information from one of the major television networks. That network owns or operates over thirty 2 GHz transmitters and over thirty receivers.

## 1995 NAB 2 GHz TV Auxiliary Facilities Survey

As shown, the average number of transmitters owned or operated increased by 13.3% from 4.5 to 5.1. Much of the increase from the earlier survey was from transmitters that are permanently installed in electronic news gathering trucks.

There are several stations which own many more transmitters. Sixteen of the stations own or operate twenty or more transmitters, and sixty-seven stations own or operate ten or more transmitters.

**Figure 1**  
**2 GHz Transmitters**  
**Average Number Owned or Operated**



Sources: 1991 and 1995 NAB 2 GHz Surveys.

Stations in the larger markets tend to have more transmitters of all types than stations in the mid-sized and smallest markets. Table 2 shows the average number of transmitters and their locations for the responding stations that indicated that they own 2 GHz microwave equipment across the different market sized groupings.

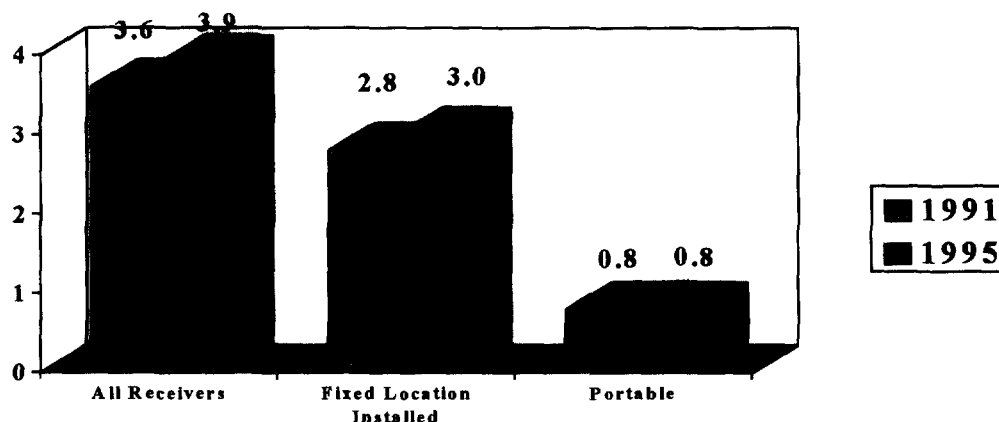
**Table 2**  
**Average Number of 2 GHz Transmitters**  
**Owned and Operated by Market Size**

	1-50	51-100	101+	Non-DMA
All Transmitters	7.2	4.3	3.5	4.3
Permanently Installed in ENG Vehicles	3.3	1.7	0.9	0.8
Portable	2.2	1.3	0.9	2.2
Installed in Fixed Locations	1.9	1.5	2.7	1.5

## 1995 NAB 2 GHz TV Auxiliary Facilities Survey

The other type of 2 GHz equipment owned by television stations is receivers. Here again, stations have a number of this specialized equipment and that number has slowly increased since the earlier survey. Figure 2 shows the average number of 2 GHz receivers owned or operated by stations which have indicated that they own 2 GHz microwave equipment.

**Figure 2**  
**Average Number of 2 GHz Receivers**  
**Owned or Operated**



Sources: 1991 and 1995 NAB 2 GHz Surveys.

There was a small 8.3% increase (from 3.6 to 3.9) in the number of 2 GHz receivers owned or operated, primarily from those receivers that are installed at fixed locations. Table 3 shows the average number of 2 GHz receivers owned or operated across the different market size groupings.

**Table 3**  
**Average Number of 2 GHz Receivers**  
**Owned and Operated by Market Size**

	1-50	51-100	101+	Non-DMA
All Receivers	4.9	3.3	3.2	4.3
Portable	1.1	0.7	0.5	2.2
Installed in Fixed Locations	3.7	2.6	2.7	2.2

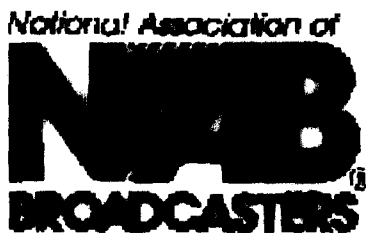
## **1995 NAB 2 GHz TV Auxiliary Facilities Survey**

---

### **IV. Conclusion**

It is clear from the results discussed above, and from the earlier survey results, that television broadcasters have made serious financial commitments to investing in 2 GHz microwave equipment. This commitment, while larger in larger markets, still is significant even in the smallest markets. Further, the amount of this commitment has grown in just the few years between the two surveys.

## **Appendix A**



## 2 GHz Facilities Questionnaire.

Dear Chief Engineer,

The FCC is considering several proposals for reallocating spectrum that either now is, or in the future could be, employed for TV auxiliary purposes. One of those proposals includes shifting broadcasters out of part of the 2 GHz band. Another is to add auxiliary spectrum at 4 GHz to accommodate auxiliary demand. We need your help in documenting your station's investment in 2 GHz equipment. Please fill out the few questions below and fax your response back to the NAB **no later than Monday, May 1, 1995** at either (202) 775-2146 or (202) 775-2533. All responses will be kept confidential. If you have any questions, please call either Mark Fratrik (202) 429-5377 or Kelly Williams (202) 429-5337.

Station Call Letters: \_\_\_\_\_ Phone: \_\_\_\_\_

Name: \_\_\_\_\_

1. Does your station own any 2 GHz microwave equipment?  
\_\_\_\_\_ Yes \_\_\_\_\_ No
2. How many 2 GHz transmitters does your station own or operate? \_\_\_\_\_
  - 2.1 Of these, how many are permanently installed in ENG vehicles? \_\_\_\_\_
  - 2.2 How many are portable units? \_\_\_\_\_
  - 2.3 How many are installed at fixed locations? \_\_\_\_\_
3. How many 2 GHz receivers does your station own or operate? \_\_\_\_\_
  - 3.1 Of these, how many are installed at fixed locations? \_\_\_\_\_
  - 3.2 How many are portable units? \_\_\_\_\_

**Please return to NAB no later than May 1, 1995.**

**NAB FAX # (202)775-2146 or (202) 775-2533**